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(71) Applicant
Deighton Engineering Ltd

(Incorporated in the United Kingdom)

Gibson Street, Bradford, West Yorkshire, BD3 9TR, United Kingdom

(72) Inventors
Peter Kenneth Hicks
Paul Martin Winn
Christopher Peter Carter

(74) Agent and/or Address for Service
Haseltine Lake & Co
Hazlitt House, 28 Southampton Buildings, Chancery Lane, London, WC2A 1AT, United Kingdom

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B8R RAJ6 R404 R451 R479
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(58) Field of search
UK CL (Edition K) B5A AF35D AF35G AF35X AT3P AV
INT CL⁵ A23L, A23P, B29C

(54) Apparatus for shaping food products

(57) A machine for shaping raw materials for food products comprises a moulding means (13), a scraper (17) for removing the shaped portion from the moulding means, a conveying means for transporting the shaped portion away from the moulding means and a drive means (11, 12 not shown) for operating the moulding and conveying means and the scraper device. In use, raw material is fed from hopper (18) to moulding cavity (22) by paddle (29). On rotation of the moulding means the shaped portion is scraped from the moulding means, by scraper (17), and the shaped portion drops on to the conveying means whereby it is transported away from the moulding means and a rigid frame formed from generally planar members (1,2,3,4) supports the moulding, conveying and drive means. In an embodiment the scraper reciprocates into and out of contact with the moulding means, at which latter point the scraper wire may be wiped. In a further embodiment the scraper wire is tensioned by device (200) which rotates only in such a direction as to tension the scraper wire. In a still further embodiment the machine includes papering means (63, 64, 65, 66, 67, 68) to apply sheet material to each shaped portion.

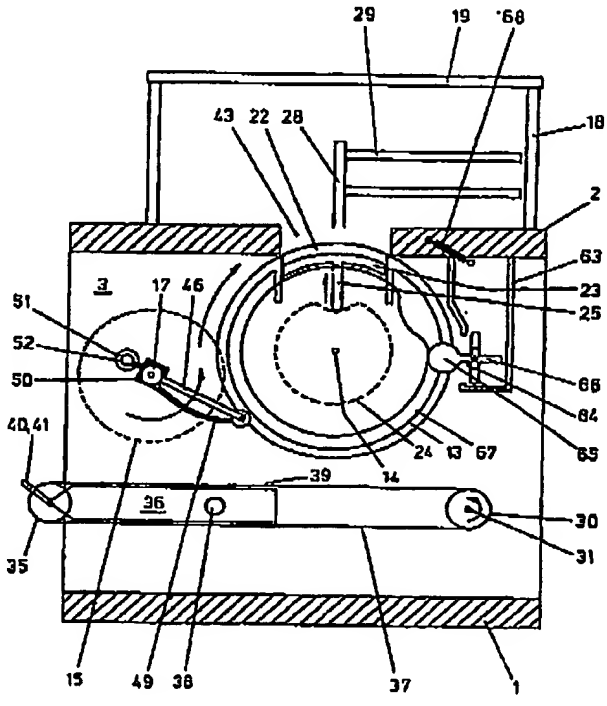

FIG. 2

GB 2 259 043 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

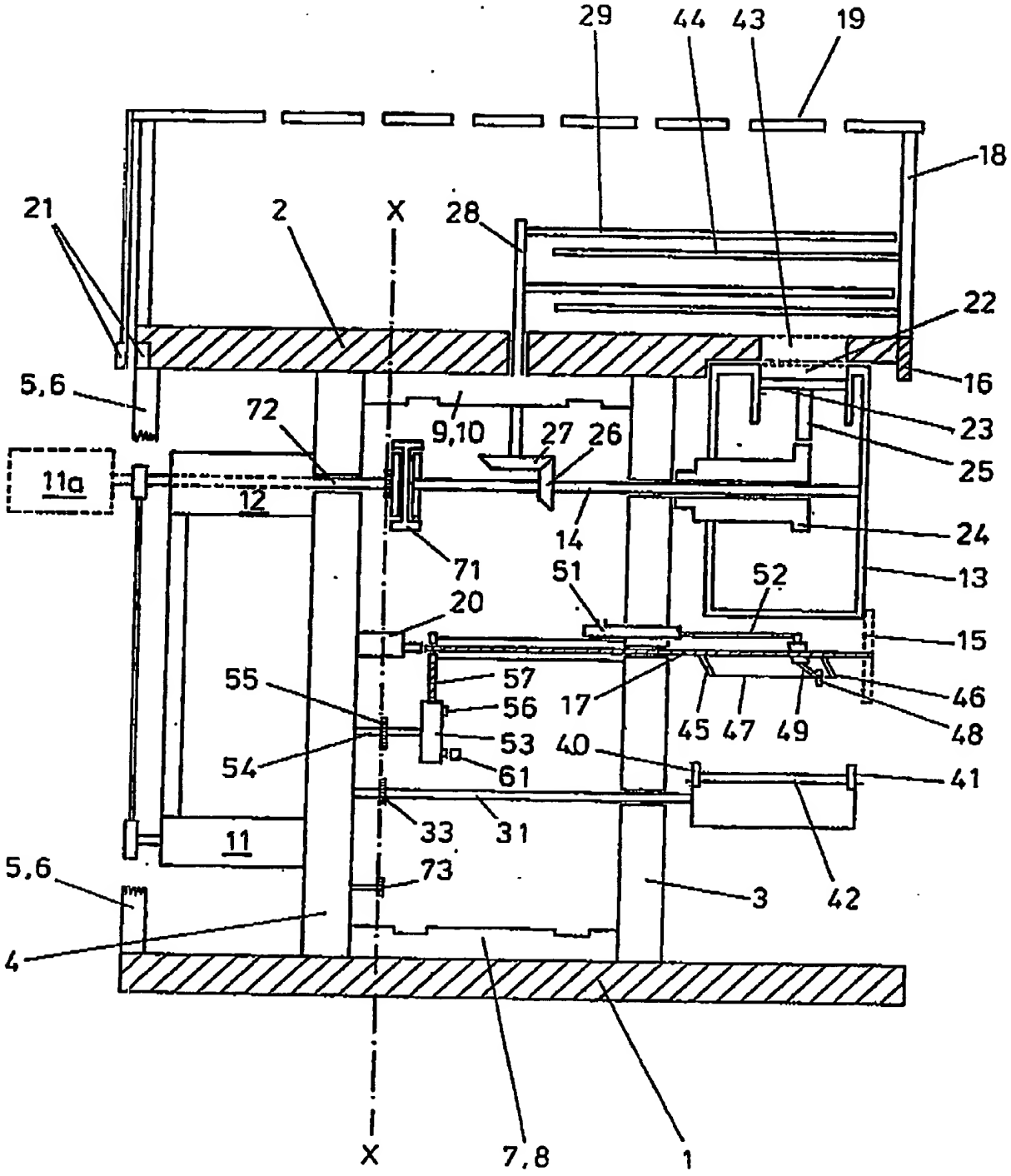
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FIG. 1

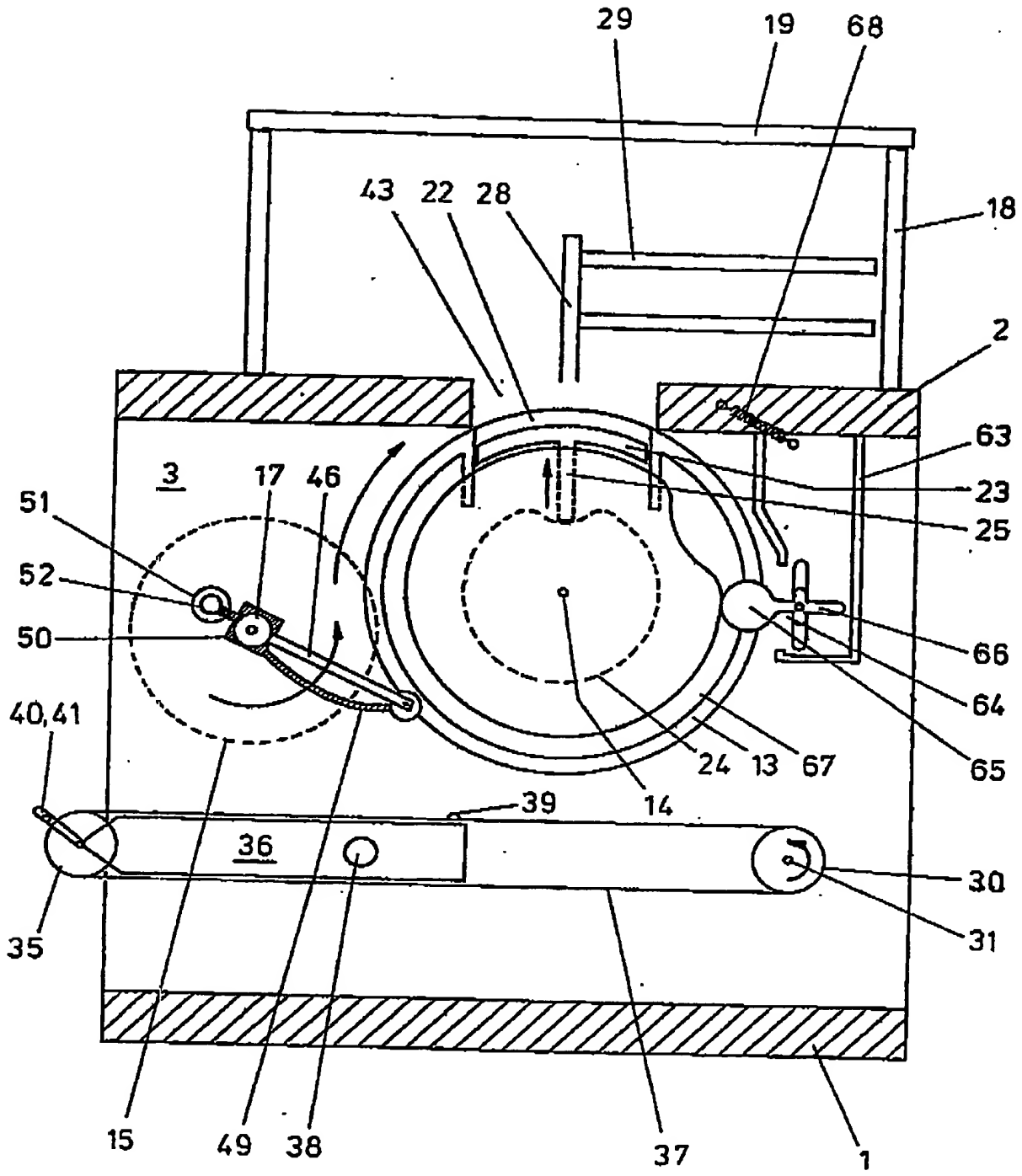
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FIG. 2

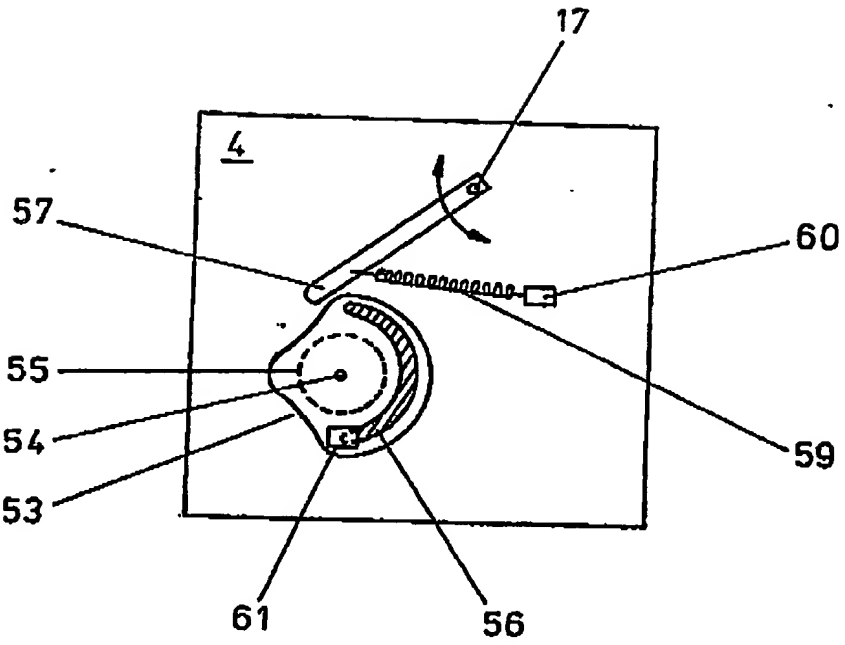

FIG. 3

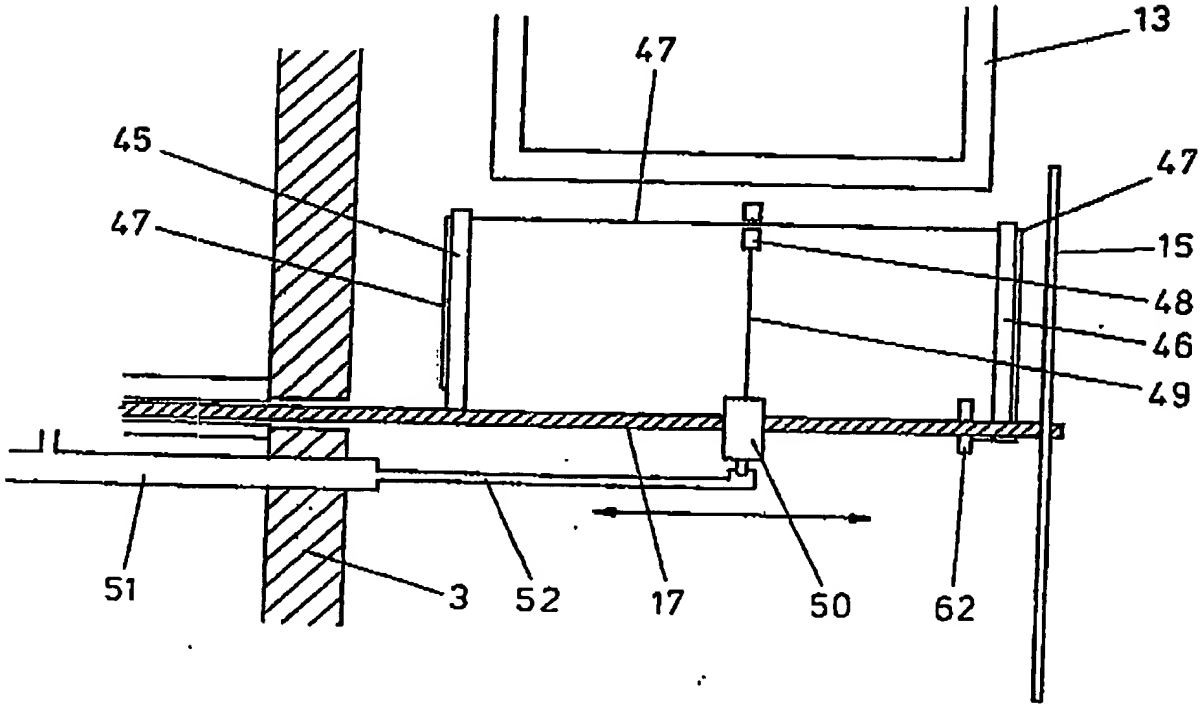

FIG. 4

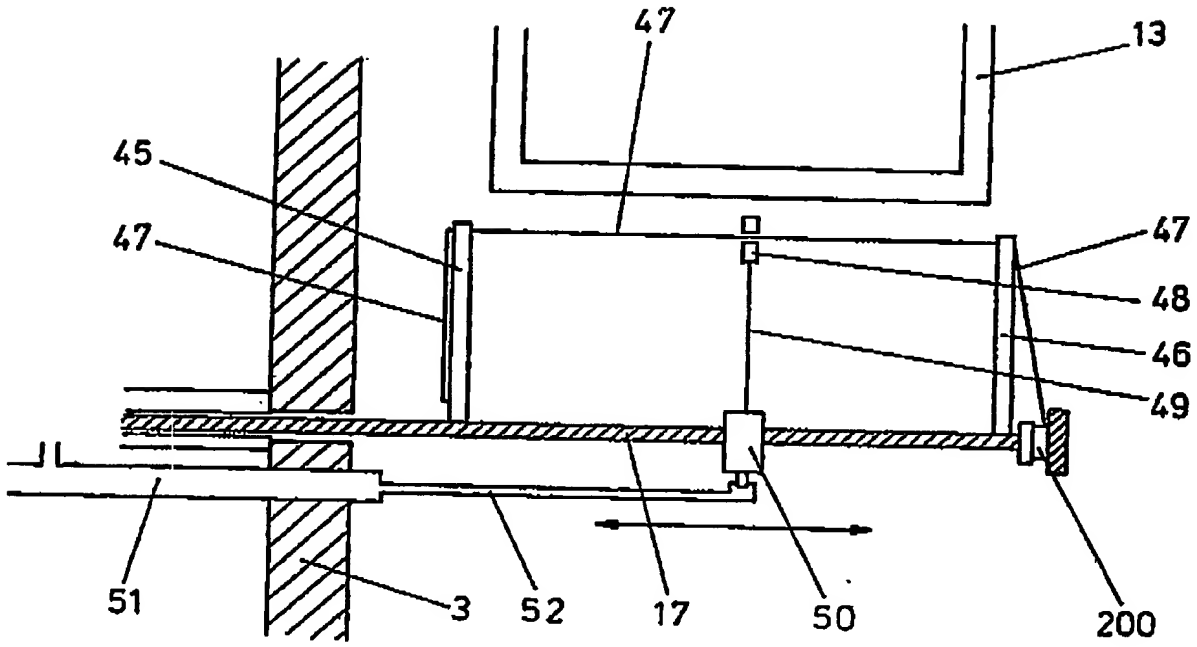

FIG. 5

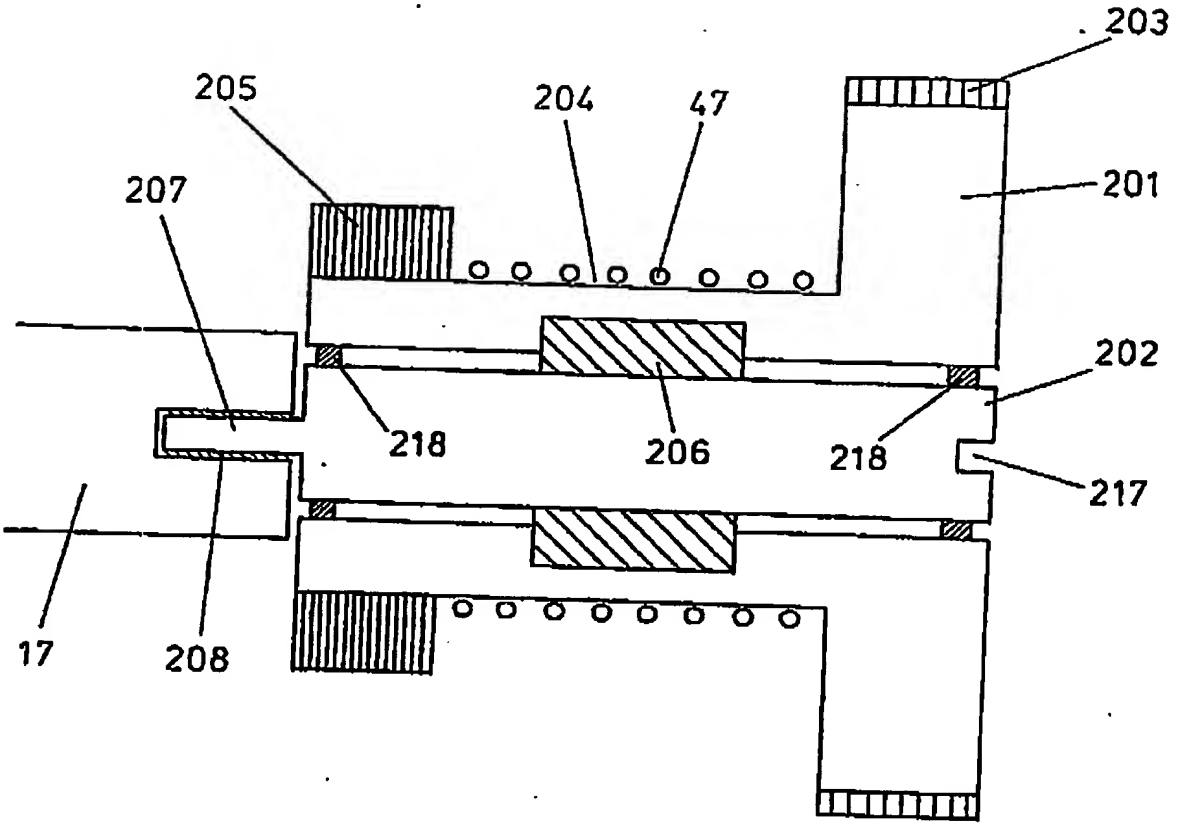
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FIG. 6

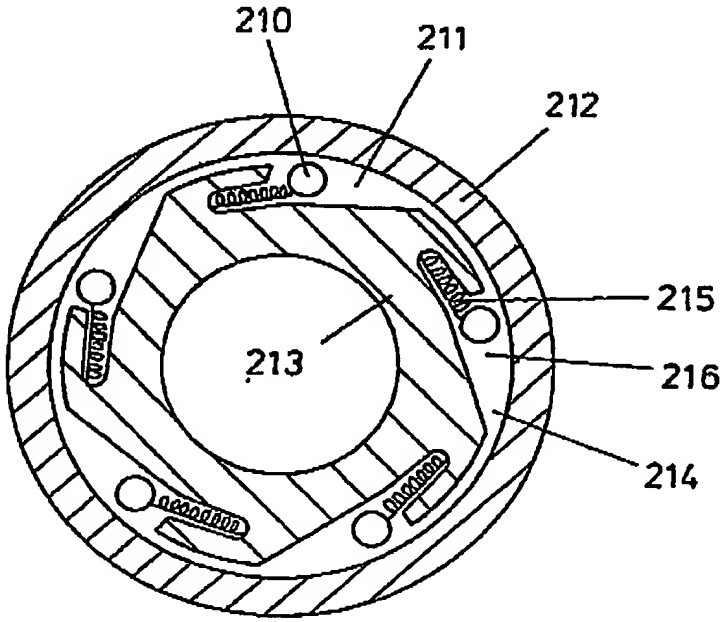
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FIG. 7

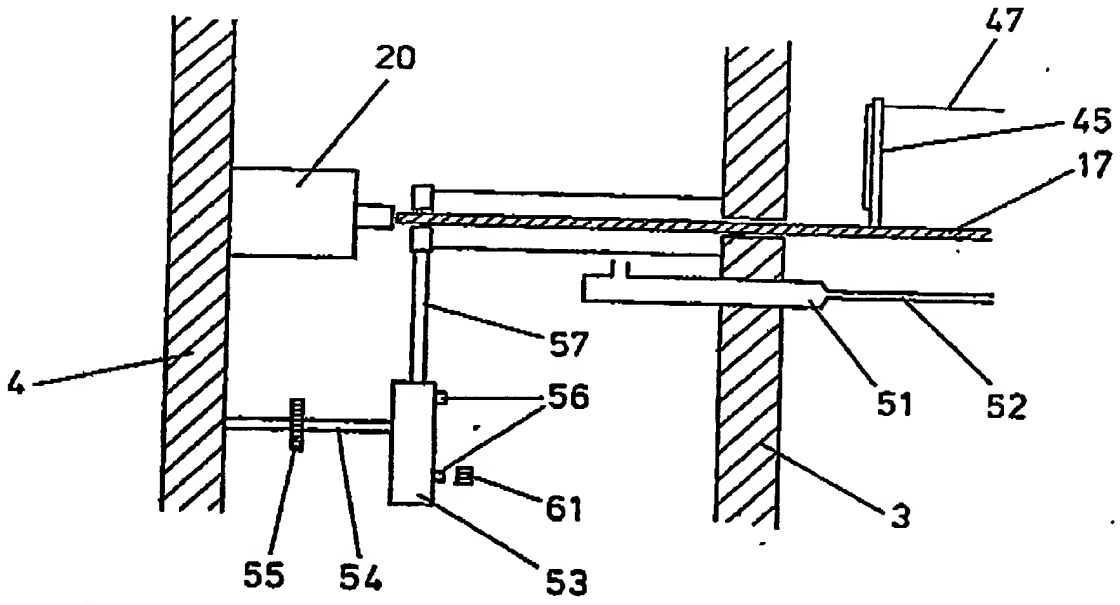
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FIG. 8

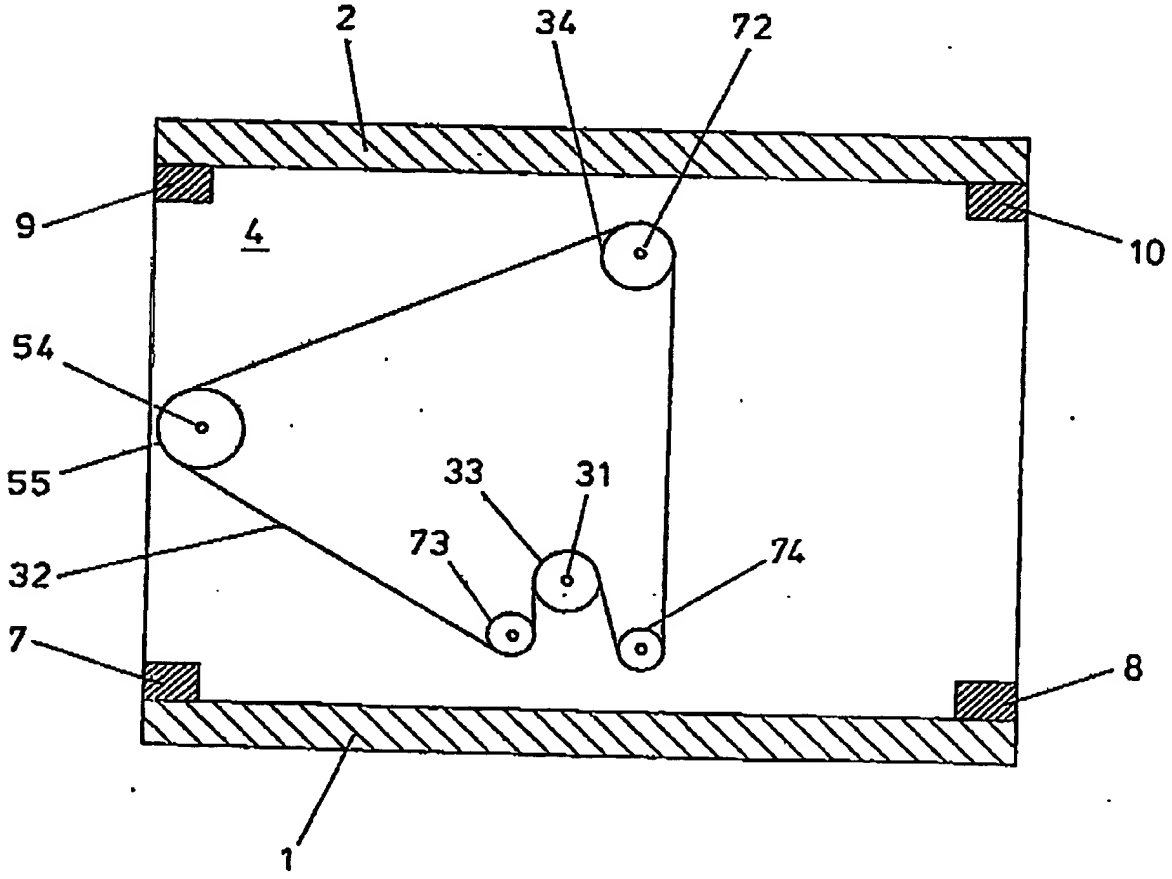
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FIG. 9

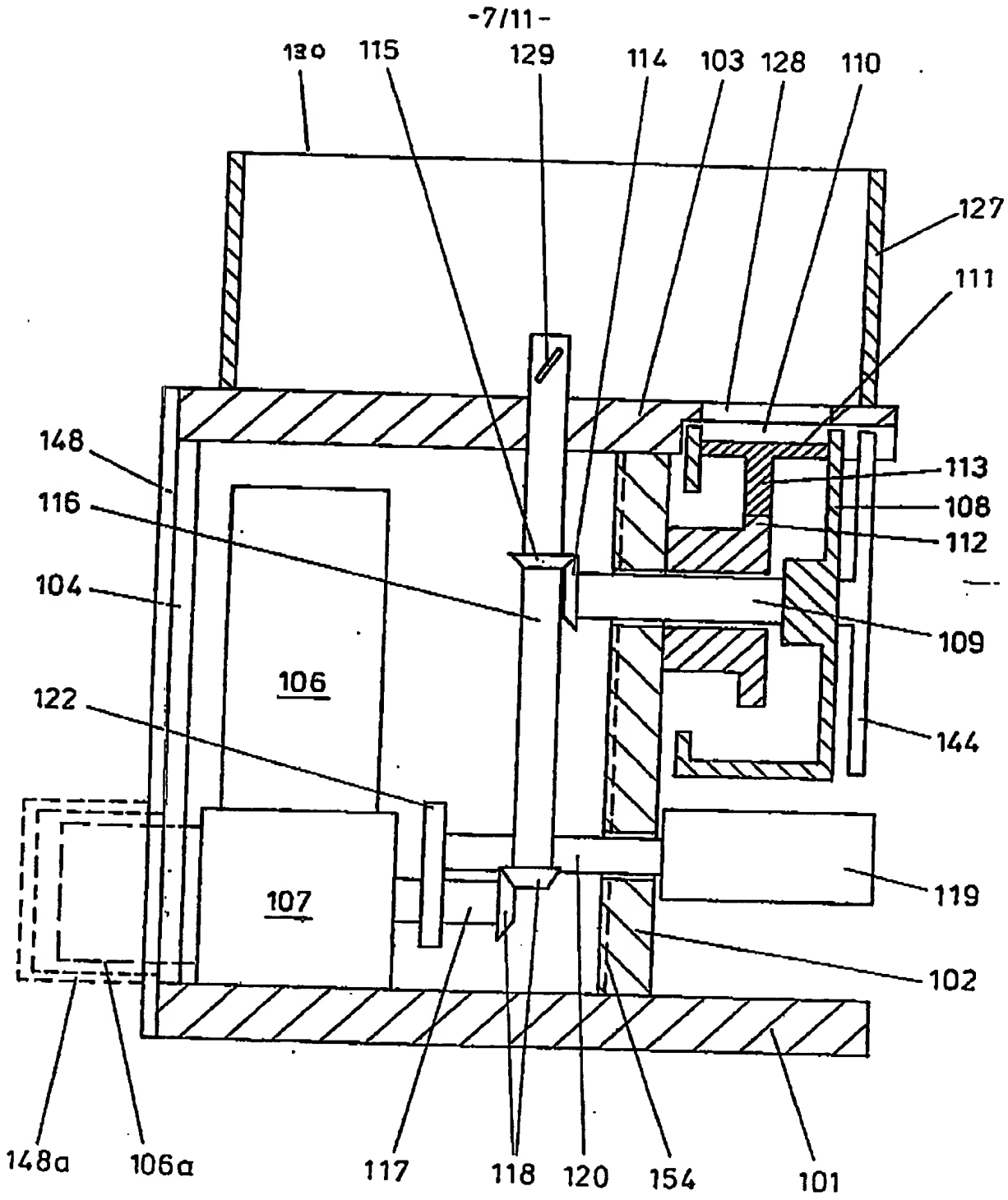
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FIG. 10

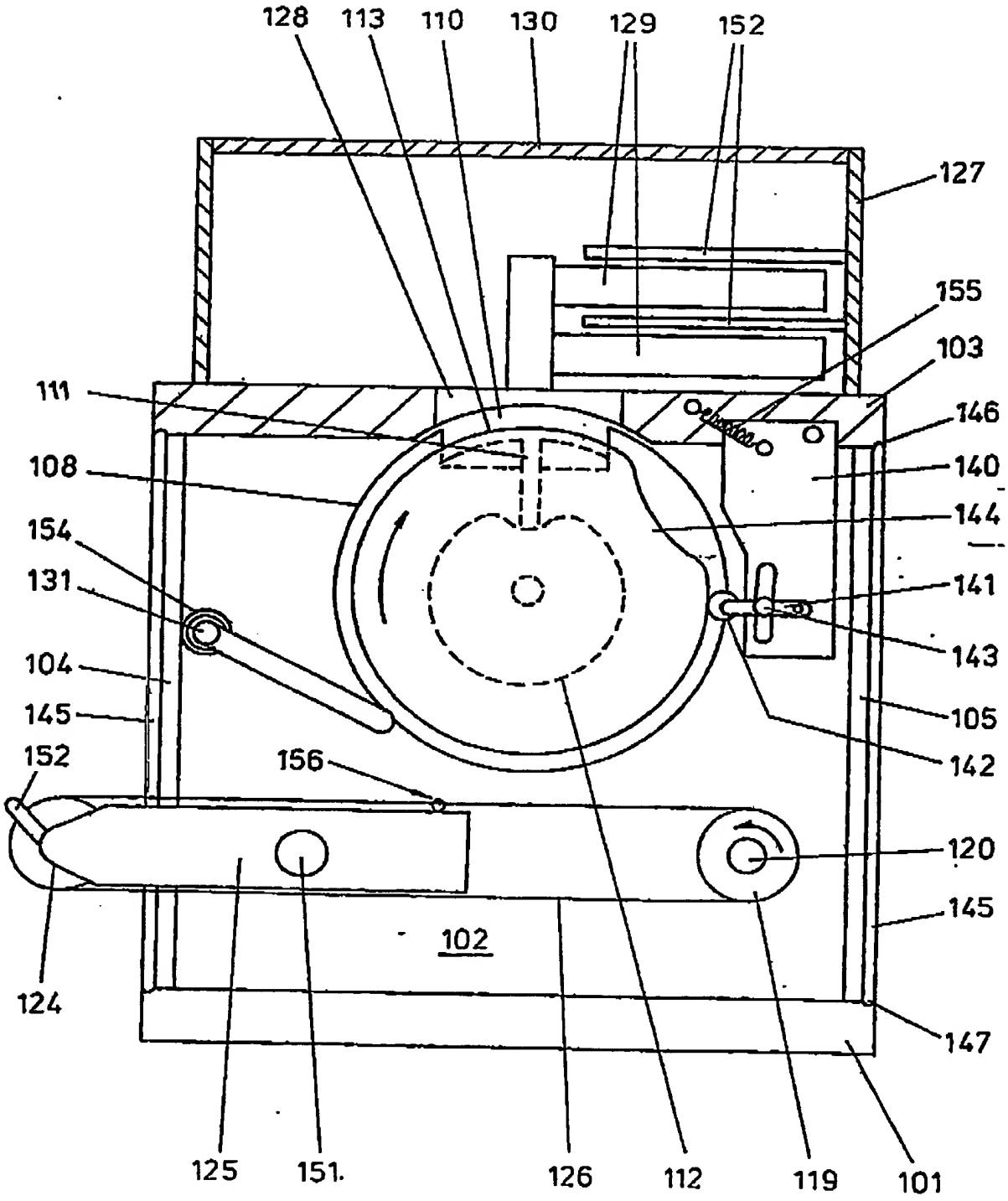
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FIG. 11

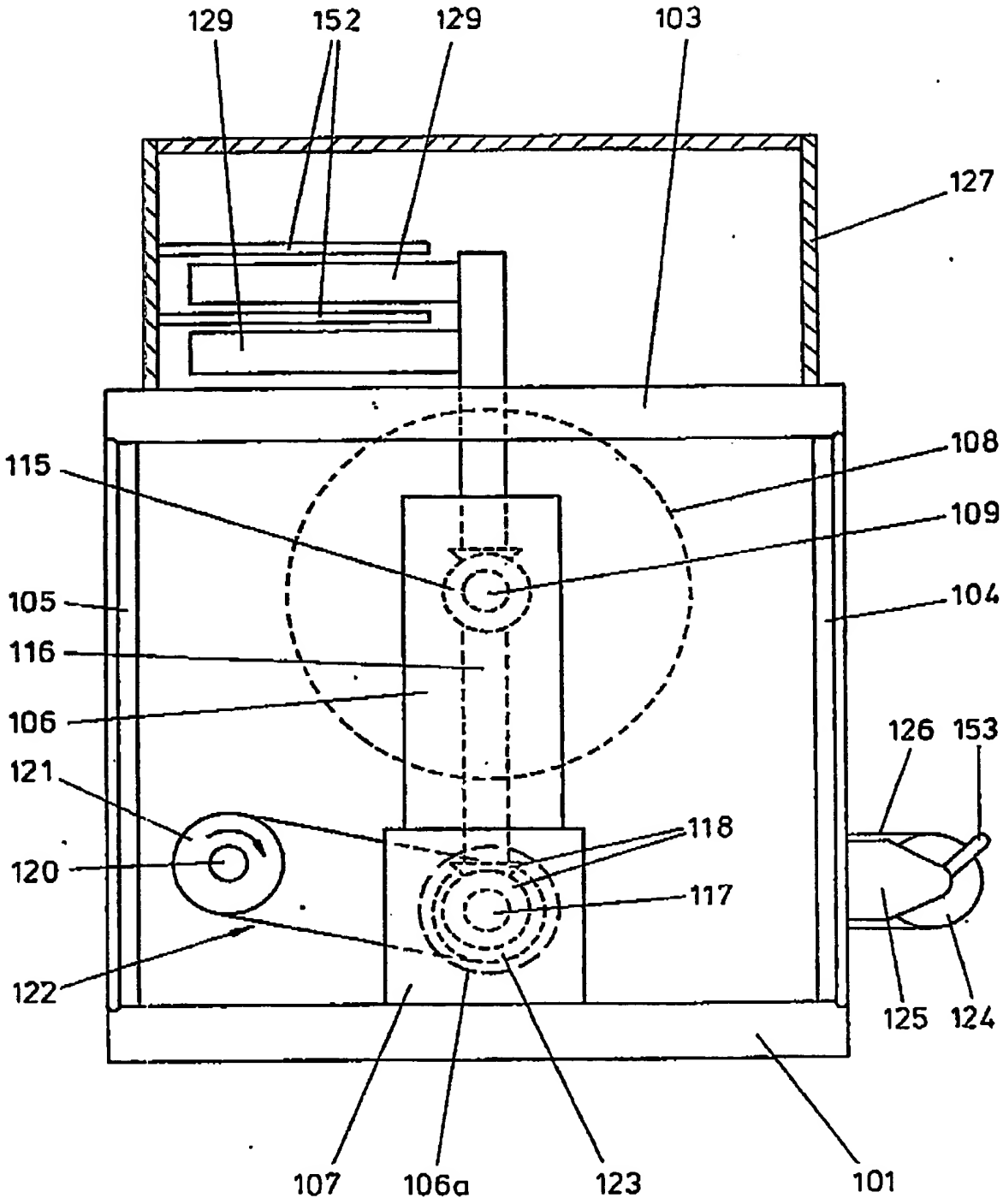
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FIG. 12

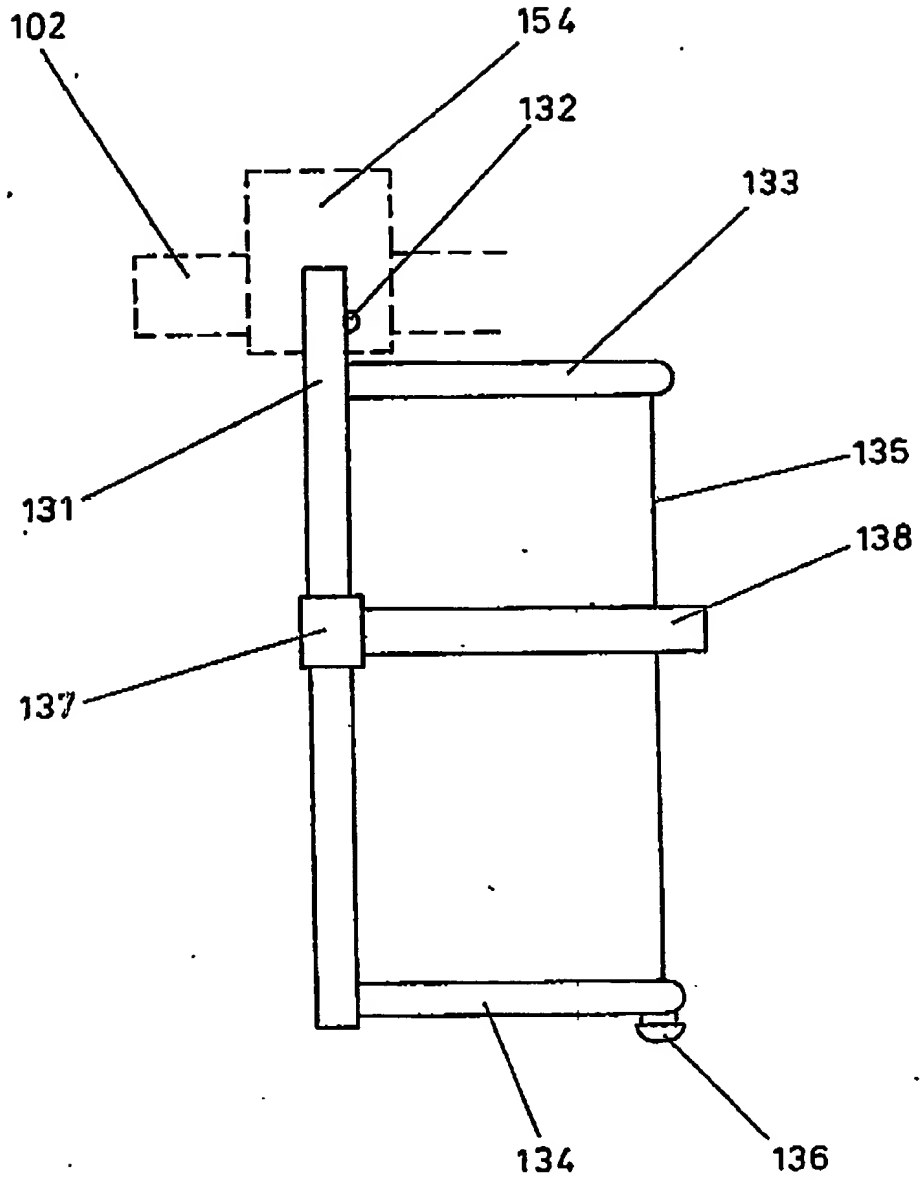

FIG. 13

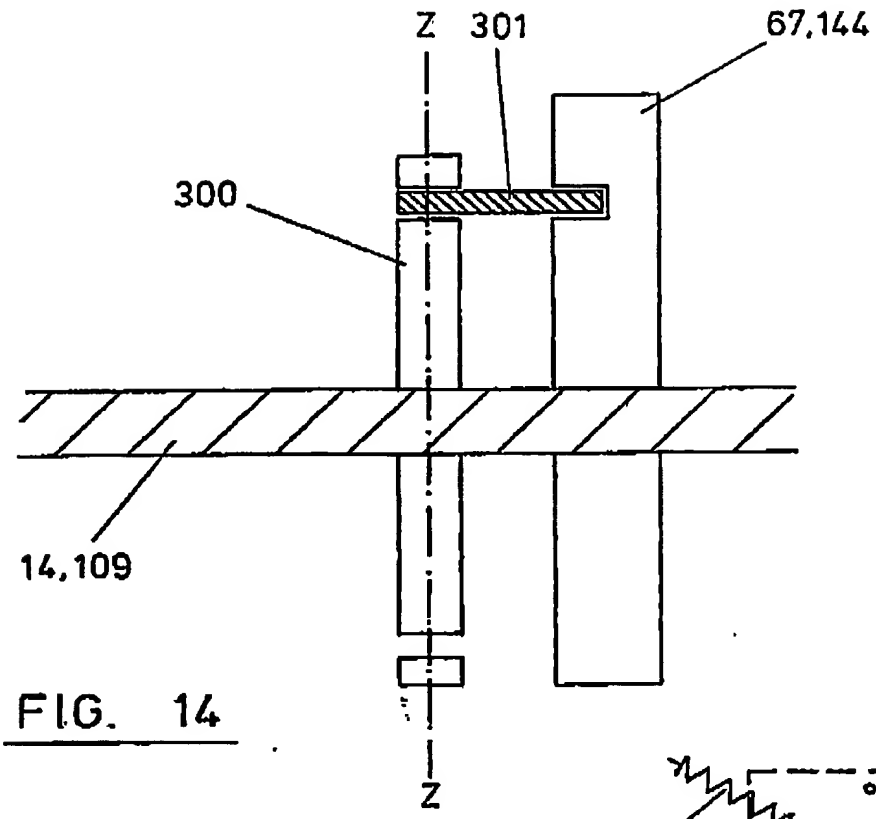

FIG. 14

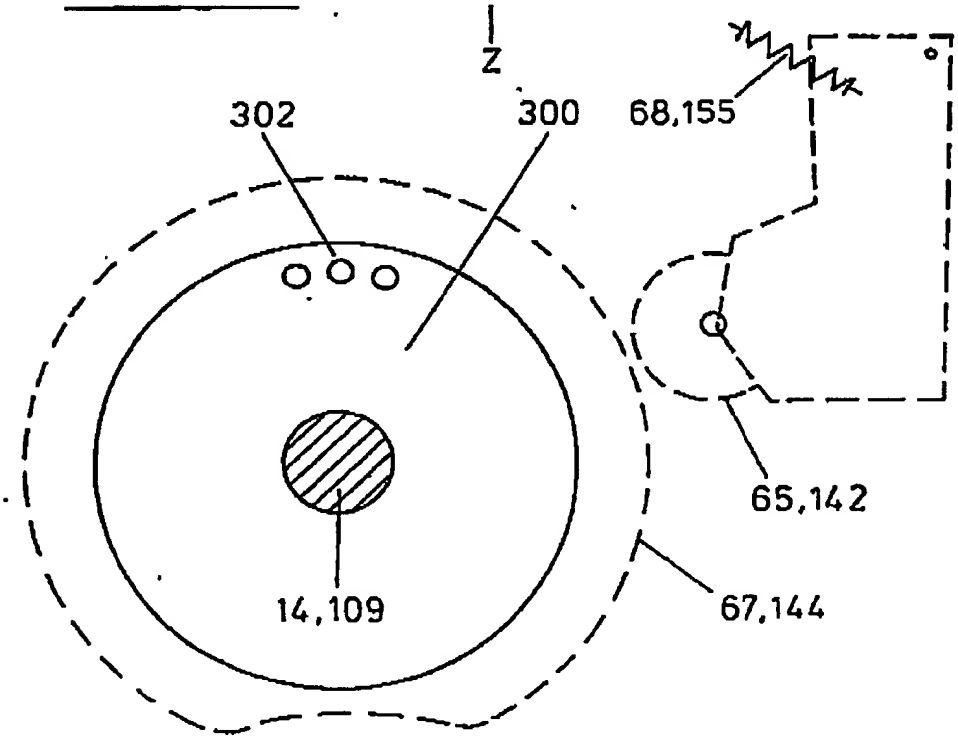

FIG. 15

Improvements in or relating to food products

This invention relates to food products and is concerned with a machine for forming raw material into shaped portions in the production of such food products.

Machines are already known for forming ground meat and like raw material into patties such as hamburgers. Generally, such machines comprise a means of introducing raw material into a motor-driven moulding device for shaping the material into the form of a patty, a means of applying sheet material such as paper or the like to a face of the patty so as to provide a barrier between adjacent patties when a plurality of the patties are stacked together, a scraper device for removing the papered patty from the moulding device and a motor driven means of conveying the papered patty out of the machine. Machines of this type are described in US patent no. 3,137,029 and British patent no. 2,192,866.

The scraper device of such machines frequently includes a tensioned wire. It is one object of the present invention to provide an improved mechanism for applying tension to the wire.

Accordingly, one aspect of the present invention provides a machine for forming raw material for food products into shaped portions and including a scraper device for removing the shaped portion comprising a tensioned wire, wherein the wire is tensioned by rotation of a tensioning device which is adapted to undergo free rotation only in a sense such as to increase the tension in the wire.

Hitherto, known machines of the above type have generally been formed of a plurality of metal castings, often of complicated shape, assembled together. Thus, there are usually many parts of the machine which are of a convoluted shape. Cleanliness is of the upmost

importance in the food preparation industry and such machines are difficult to clean. Moreover, in the event of the machines developing a fault, it is often difficult and/or time consuming to dis-assemble the machine in order to make repairs. Further, because of the use of complicated castings, the actual manufacture of the machines is difficult and expensive. Also, during use of the machine, parts of the machine come into contact with the raw material and ever more stringent hygiene standards require these parts to be made of materials acceptable in the food preparation industry.

It is a further object of the present invention to provide a forming machine which overcomes these problems.

Accordingly another aspect of the present invention provides a machine for forming raw material for food products into shaped portions which machine comprises a frame formed from a generally planar base member, a generally planar upper member and a generally planar wall member linking the base and upper members together in a generally parallel relationship, a moulding means for forming the raw material into a portion of the desired shape, a scraper device for removing the shaped portion from the moulding means, a conveying means for transporting the shaped portion out of the machine, and drive means for the moulding means and conveying means, wherein said drive means, moulding means, scraper device and conveying means are all mounted on one or other of said members.

In a preferred embodiment, first and second generally spaced wall members are provided to link the base and upper members together. In this case, said drive means preferably comprises a motor and means of transmitting motion from the motor to the moulding means and conveying means wherein said transmitting

means is located between the wall members.

Accordingly a further aspect of the present invention provides a machine for forming raw material for food products into shaped portions which machine comprises a moulding means for forming the raw material into a portion of the desired shape, a scraper device for removing the shaped portion from the moulding means, a conveying means for transporting the shaped portion out of the machine, and drive means for the moulding means and conveying means, the arrangement being such that the scraper device reciprocates between a first limit position where it contacts the surface of the moulding means to remove the shaped portion therefrom and a second limit position in which it is remote from the moulding means.

The planar members forming the frame may be formed integrally or be in the form of two or more separate components appropriately secured together.

In a particularly preferred embodiment, the machine also includes a papering means for applying sheet material such as paper or the like to a face of the shaped portion so as to provide a barrier between adjacent portions when a plurality of the portions is stacked together. In such a case, this papering means will also preferably be mounted on one or other of the members.

The drive motor may be mounted on the planar base member or on the or one of the wall members. In the case where there are two wall members, the drive motor is advantageously mounted on one of the wall members and drives a gearbox by means of, for example, a vee-belt which is located on that side of the wall member which is remote from the other wall member. The papering means (if present) is preferably mounted on the upper member, and the moulding means, scraper device and the conveying means are preferably located

on that side of the other wall member which is remote from the drive motor. In an embodiment, a drive means is provided to automatically actuate the scraper device. Alternatively, the scraper device may be actuated manually.

In another advantageous embodiment the motor and gearbox are aligned such that their principal shafts enjoy a common axis and are mechanically linked.

In order to provide a store of raw material and to transfer raw material from the store to the moulding means, the machine may include a hopper mounted on top of the upper horizontal member and including a paddle to force the raw material through an aperture in the upper member and into the moulding means. The paddle may be rotatably driven by the gearbox via a shaft whose axis is co-axial with that of the gearbox shaft and is connected to the gearbox shaft via a coupling means.

In a particularly preferred embodiment, the moulding means comprises a rotable drum which includes at least one mould cavity in its circumferential surface. The or each mould cavity is provided with a mould bottom which reciprocates in the cavity in a direction radially with respect to the drum. The hopper is arranged to feed the raw material to the mould cavity of the drum when the mould bottom has been retracted away from the circumferential surface of the drum. The drum rotates with respect to the hopper and the mould cavity thereby transports the raw material therein towards the conveying means. A papering means applies a sheet of paper or the like to the free surface of the raw material in the cavity prior to being transferred to the conveying means. The moulding means, the conveying means, the hopper paddle and the scraper device are preferably all driven by the same drive motor, linked, for example, with a chain driven

sprocket drive. As the drum rotates, the raw material is pushed out of the or each mould cavity as a consequence of the mould bottom moving towards the circumferential surface of the drum and is then stripped off by a scraper so as to drop onto the conveying means. The motion of the mould bottom is preferably effected as a result of its mechanical cooperation with an appropriately profiled cam.

In a further preferable embodiment the motor may be a variable speed motor.

It is particularly preferred for the frame members, moulding means, and other components which are likely to be in long term contact with the raw material, to be formed of a material which is both mechanically strong and acceptably hygienic for use in the food manufacturing industry. Suitable materials are acetal resin, stainless steel or other material, such as aluminium, when suitably covered with a material acceptable in the food industry. However, any material can be used which is light weight, strong, dimensionally stable at the temperatures of use, machineable and acceptable in the food industry and which has good release and easy cleaning properties.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1 is a partly sectioned diagrammatic side view of one embodiment of a patty forming machine in accordance with the invention,

Figure 2 is a front view of the machine shown in Figure 1,

Figure 3 is a front view of a part of the machine shown in Figure 1, showing the cam device for actuating the scraping means,

Figure 4 is a plan view of a part of the machine

of Figures 1 to 3 in the vicinity of the scraping means and the drum,

Figure 5 is a plan view of another embodiment of the part of the machine shown in Figure 4,

Figure 6 is a schematic section along line Y-Y of the embodiment of Figure 5,

Figure 7 is a plan view of a grip-roller type clutch forming part of the embodiment of Figures 5 and 6,

Figure 8 is a plan view of another part of the machine of Figures 1 to 7 which shows a safety micro-switch and its relationship with the scraping means,

Figure 9 is a schematic section along line X-X of the machine of Figure 1 showing the driving means connecting the drum, the scraper cam, the conveying means and the gearbox,

Figure 10 is a partly sectioned diagrammatic side view of one embodiment of a patty forming machine in accordance with the invention,

Figure 11 is a front view of the machine shown in Figure 10,

Figure 12 is a rear view of the machine shown in Figure 10,

Figure 13 is a plan view of a part of the machine of Figures 10 to 12,

Figure 14 is a plan view of a further embodiment of the machine of Figures 1 to 13, and

Figure 15 is a schematic section along line Z-Z of the embodiment of Figure 14.

Referring now to Figures 1 to 9, the machine includes a frame comprising a generally planar horizontal base member 1, a generally planar horizontal upper member 2, a first generally planar vertical upright member 3 secured to the upper and lower horizontal members so as to be perpendicular to said upper and lower members 1, 2. A second generally

planar vertical upright member 4 is of substantially the same dimensions as the first upright member and is secured to the upper and lower horizontal members such that it is perpendicular to said upper and lower members, and parallel to and spaced from said first upright member 3. Additionally, two corner supports 5, 6 (not fully shown) are provided between the base member 1 and the upper member 2 to provide extra rigidity. Four crossmembers 7, 8, 9, 10, two fastened to the lower horizontal member and two to the upper horizontal member, are located at each edge of the machine between the upright members to provide further reinforcement. The wall members 3 and 4 are bolted to the crossmembers 7 to 10. The members 1 and 2 are formed of an acetal resin such as that known as Delrin (Du Pont) and wall members, 3 and 4 are formed of stainless steel, or aluminium faced with a stainless steel sheet.

An electrically driven motor 11 and a gear box 12 are mounted horizontally on the rear side of the second upright base member 4. If desired, the motor may be mounted co-linearly with the gearbox as shown by the dotted line 11a. A moulding means in the form of a drum 13 is keyed on to a shaft 14 extending through an aperture in the wall member 3 and mounted for rotation therein. The shaft 14 terminates in one half of a coupling member 71, the other half of which is affixed to the end of the shaft 72 of the gearbox 12, shaft 72 extending through an aperture in wall member 4. By keying the drum 13 to the shaft 14, the drum 13 can be readily withdrawn from the shaft to enable the drum, shaft and wall member 3 to be cleaned.

However, removal of the drum 13 requires removal of pin 16 which, in the embodiment shown, is fixed to hopper 18. Hence, removal of pin 16 cannot be accomplished without removal of the hopper 18 and the

hopper 18 cannot be removed without displacing its lid 19. Displacement of the hopper lid results in the severance of an electrical contact made via a magnetic switch 21 and hence isolation of the electrical supply to the motor. The scraper device is also interlocked so that when support shaft 17 is withdrawn, the contacts of micro switch 20 are broken causing isolation of the electrical supply to the motor 11. Thus any attempt to remove the drum or hopper for the purpose of removing pin 16 or cleaning or refilling the hopper 18 results in a failsafe inoperation of the machine. Optionally, as an alternative or addition to interlocking pin 16, a disc 15 may be mounted on the scraper device support shaft 17 the interlock being provided by interference between the disc 15 and the drum whereby the disc 15 prevents the drum being withdrawn without isolating the electricity supply to the motor.

The drum is also formed of an acetal resin and includes, in its circumferential surface, a mould having a circular mould cavity 22. (It will be appreciated that the mould cavity can be of any desired shape and that the drum may include more than one mould cavity). The bottom of this mould cavity 22 is defined by a plunger 23 arranged to reciprocate within the mould cavity 22 between a retracted position in which the cavity can receive raw material and a forward position in which the free surface of the plunger 23 protrudes slightly beyond the circumferential surface of the drum 13. The reciprocal movement of the plunger 23 is controlled by a plunger cam 24 rigidly secured to the wall member 3 and having a profile which is followed by cam follower 25 on the plunger 23. A bevel gear 26 is mounted on shaft 14 and is in cooperation with a second bevel gear 27 mounted on a vertical shaft 28 and driving a paddle in the form of blades 29 which are located inside the hopper.

The machine als includes a conv ying means for removing, from the machine, the patties formed by the moulding means. This conveying means comprises a first roller 30 fixed to a shaft 31 passing through an aperture in the upright wall member 3 and mounted for rotation therein. The shaft 31 is driven from the output side of the gear box 12 via a chain 32 connecting sprocket 33, mounted on shaft 31, to sprocket 34 mounted on the output side of the gearbox. Sprocket 74 provides a tensioning means for the drive means and sprocket 73 is an idler sprocket. A second roller 35 is mounted at an end of a platform 36 detachably secured to the wall member 3 by a rod 38 extending into an aperture in the wall member 3. The arrangement is such that the platform 36 would pivot about rod 38 in an anticlockwise direction as viewed in Fig 2 in the absence of a stop 39 provided on the wall member 3. A conveyor belt 37 extends around rollers 30 and 35 so as to be driven by the roller 30. The rollers 30 and 35 are both formed of acetal resin and the conveyor belt 37 is formed of a material which can readily be kept clean and is approved for food contact. By pivoting the platform 36 in the clockwise direction, the effective distance between rollers 30 and 35 can be shortened to facilitate removal and refitting of the conveyor belt 37. The roller 30 and the platform carrying roller 35 can be readily detached from the wall member 3 for cleaning purposes.

A pair of arms 40 and 41 is provided on the platform 36, one at each end of roller 35, and a scraper wire 42 is stretched between the arms so as to bear against the conveyor belt 37 to strip the patties therefrom.

The hopper 18 is in the form of an open ended tube of stainless steel and is seated on the upper surface of the upper memb r 2. The upper member 2 includes an aperture 43 whereby raw material can pass from the

hopper 18 into the mould cavity 22 of the drum 13. (If desired, the hopper may include a bottom wall provided with an aperture in registry with the aperture 43). The paddle is in the form of a pair of stainless steel blades 29 provided in the hopper 18 and these are affixed to the upper end of shaft 28 so as to rotate with the shaft 28. The blades are angularly displaced relative to each other by about 15°. The blades are angled and, as they rotate, they co-operate with a pair of bars 44 attached to the hopper 18. In this way, rotation of the blades 29 forces the raw material in the hopper through the aperture 43. The upper end of the hopper is protected by the lid 19 which may, for example be in the form of a grid or a sheet of apertured plastics material, and is inter-linked with the electricity supply to the motor 11 via the magnetic safety switch 21 whereby the motor will stop in the event that an attempt is made to remove lid 19 whilst the machine is operating.

The lid 19 is slidably mounted between a pair of side guides (not shown) whereby it can be displaced with respect to the hopper tube as previously described. Each side guide is removably mounted on the hopper tube by interengagement of studs (not shown) on the tube and apertures on the side guide. The hopper tube is provided with a plurality of fixing devices including apertures (not shown) for engagement with studs (not shown) on the upper member 2.

The machine includes a spring loaded scraper device for detaching the shaped portion from the drum surface. This device includes a supporting shaft 17, a pair of arms 45, 46 rigidly mounted thereon, a scraper wire 47 extending between the ends of arms 45, 46, a thin disc 48 which is free to move along the wire and fastened via arm 49 to a sliding support 50 which is mounted on shaft 17. The sliding support 50 may move along shaft 17 and hence cause the disc to move

along the wire, thereby scraping unwanted debris from the wire, between the side arms 45, 46, its motion being effected automatically by means of a two-way pneumatic piston 51 mechanically linked via rod 52 to the sliding support 50 (as shown) or manually.

A rotating cam 53 mounted on shaft 54 and driven by sprocket 55 rotates in cooperation with the drum 13 such that one revolution of the drum corresponds to one revolution of the cam. A cam follower 57 is maintained in contact with the cam 53 by a spring 59 operating under tension and mounted on side wall member 4 by fixing means 60. The other end of the cam follower 57 is affixed to the shaft 17. As cam 53 rotates cam follower 57 undergoes a reciprocating motion determined by the cam profile, which is transmitted to the scraper device via shaft 17 such that at one extreme the scraper wire 47 is held in contact with the circumferential surface of the drum via the spring pressure, the cam follower being clear of the cam profile, and at the other extreme the scraper wire 47 is displaced away from drum 13 by the cam profile. In the case where the scraper wire is cleaned automatically, a detecting means 61, adjacent to the face of cam 53, detects the presence of a metal strip 56 located on the face of cam 53, and when the metal strip 56 is detected the two-way pneumatic piston 51 is actuated such that the disc 48 is moved outwards across the scraper wire 47 towards the front and away from wall member 3, whilst the scraper wire is remote from the surface of drum 13. The absence of the metal strip 56 on the appropriate part of the cam causes the two-way pneumatic piston to return disc 48 to a position where it is closest to upright wall member 3 and will not interfere with the drum 13 when scraper wire 47 once again makes contact with the circumferential surface of the drum. The cam 53 and metal strip 56 are arranged such that the disc 48 is caused to clean the

scraper wire 47 by its motion along the scraper wire 47 between arms 45 and 46 whilst the scraper wire 47 is remote from the surface of drum 13. When the scraper wire 47 is biased into contact with the circumferential surface of the drum 13 it detaches each patty from the drum as the drum rotates.

A tensioning device 62 is provided whereby the tension in the scraper wire 47 can be adjusted.

Tension in scraper wire 47 is maintained via a rotatably mounted sliding disc 62 which is free to move along shaft 17. Scraper wire 47 is fastened at its inner end via a stop (not shown) fixed to side arm 45 and passes along side arm 45, away from shaft 17, through a wire guide (not shown) on side arm 45, thin scraper disc 48, a second wire guide (not shown) located on side arm 46 (not shown), and along the length of side arm 46 towards shaft 17. A third wire guide (not shown), on shaft 17 directs the wire to disc 62 and to which the other end of scraper wire 47 is fastened. Disc 62 may be slid along shaft 17 towards side arm 45 to take up any slack in the wire. Rotation of disc 62 about shaft 17 causes the entrained wire to wrap itself about shaft 17 and introduces a tension into scraper wire 47. Once the required tension is attained disc 62 may then be immovably fastened in position by tightening a screw or the like, threaded into disc 62 in a radial direction, such that the screw or the like bites into shaft 17 thereby tightening disc 62 firmly onto shaft 17.

In an embodiment the scraper wire may be tensioned by means of a rotatable hand knob 200 threaded into the outer end of shaft 17. The inner end of scraper wire 47 is fixed to side arm 45 and guided between side arms 45 and 46 as described above; scraper wire 47 is then guided from its outermost point on side arm 46, along side arm 46 and around knob 200.

Knob 200 is essentially formed of two parts, an

outer body 201 and an inner body 202. Both the inner and outer bodies are formed from a material acceptable in the food industry such as stainless steel or coated aluminum, or a hard plastic such as Delrin (Du Pont). The exterior form of outer body 201 of knob 200 comprises an outer knurled hand grip 203, a recessed grooved portion 204 about which wire 47 may be wound and a raised inner lip 205 which prevents the wound wire slipping off the knob towards shaft 17. Scraper wire 47 may be fastened to knob 200 by means of an eye or catch or the like (not shown) located, for example, in groove 204. Inner body 202 of knob 200 includes a device 206 which may only rotate in one sense, such as a clutch or ratchet, and a threaded bolt 207 which is fixed into an appropriately threaded socket 208 located in the end of shaft 17. Outer body 201 is mechanically fastened to inner body 202 via one way clutch or ratchet 206 such that outer body 201 may rotate about inner body 202 in one direction only.

The one way device 206 may be a free-wheeling clutch such as the grip-roller type wherein each roller 210 is gripped in the wedge shaped space 211 as soon as the movement of the outer race 212 in relation to the inner race 213 causes the roller 210 to move into the shallower part 214 of this space under the influence of spring 215 (clockwise movement in the illustrated embodiment). The two races 212,213 are locked together and the clutch is engaged so relative rotation cannot occur. When the relative movement of the outer race 212 with respect to the inner race 213 is an anti-clockwise direction, the rollers 210 move into the deeper part 216 of their housing, against the action of spring 215, the clutch is thereby disengaged and free rotation may occur. A ratchet mechanism (not shown) comprising a toothed wheel and a spring loaded pawl may be used to the same effect.

Threaded bolt 207 is tightened onto shaft 17 by

means of slot 217 located on the outer side of knob 200 and suitable for the admission of a screwdriver or key. Any attempt to rotate outer body 201 in the opposite sense results in inner body 202 being driven in the same sense. In the preferred embodiment in which anti-clockwise rotation of outer body 201 effects tension in scraper wire 47 the tensile force, or any deliberate attempt to relieve the tension in the wire, by clockwise rotation, would result in a small clockwise rotation of both outer 201 and inner 202 bodies whilst bolt 207 tightened further, requiring an increasing force, into shaft 17.

A pair of seals 218 is mounted either side of the one way device 206 on the interior surface of outer body 201 to prevent moisture and debris from penetrating and clogging one way device 206 during operation or cleaning. The seals 218 may be fabricated from rubber or plastics material.

The machine includes a papering means for applying a sheet of paper to each patty. This papering means includes a frame 63 pivotally mounted on the upper member 2, preferably in a manner such that it can be readily detached for cleaning purposes. The frame 63 has an open side which is adjacent to the drum 13 and includes a stack of paper sheets which is biased towards the open side by means of a spring (not shown). Each sheet includes an aperture whereby it is suspended on a knife edge (not shown) secured to the frame 63. The papering means includes an arm 64 pivotally mounted at one end to the frame and terminating at its other end in a cam follower 65. The angle of inclination of the arm 64 can be varied and the arm can be locked in a desired inclination by means of nut 66. The cam follower 65 follows the profile of a cam 67 mounted for rotation with the drum 13 under the influence of spring 68.

In use, minced meat or other raw material is

inserted in the hopper 18 and is agitated by the blades 29 and urged through the aperture 43. As the drum 13 rotates, the arrangement of the plunger cam 23 is such that the plunger 25 is fully retracted from the circumferential surface of the drum 13 when the mould cavity 22 is in registry with the aperture 43. Thus, raw material is forced into the mould cavity 22 and is formed into a disc-shaped patty in conformity with the shape of the cavity. Continued rotation of the drum causes the plunger 23 to slide within cavity 22 as a consequence of the cam follower 25 following the profile of the plunger cam 24 whereby the patty is pushed out of the mould cavity 22 but remains adhered to the free surface of the plunger 23 (which surface is now projecting beyond the circumferential surface of the drum) due to its natural tackiness and hydraulic forces. As the patty starts to be ejected from the mould cavity, it passes the papering means which is urged towards the patty under the influence of spring 68 as the cam follower 65 follows the profile of the cam 67. As a result, the outermost sheet of paper in the frame 63 contacts the free surface of the patty and adheres thereto. Continued rotation of the drum causes the frame 63 to revert back to a position where it is spaced from the drum surface against the spring under the influence of the cam 67. Meanwhile, the rotating drum carries the shaped portion of patty together with its paper sheet towards the conveyor belt 37. The papered patty is removed from the drum 13 by the scraper wire 47 and drops onto the conveyor belt 37. It is thereby carried out of the machine and removed from the belt by the scraper wire 42. Further rotation of the drum brings the mould into registry with aperture 43 to receive further raw material for forming into another patty.

Any raw material adhering to the scraper wire 47 is readily removed by the wiping motion of disc 48

along wire 47. This motion occurs when the scraper wire 47 is not in contact with the circumferential surface of drum 13. If necessary, the scraper device can be readily detached from the upright wall member 3 for cleaning purposes by withdrawal of the shaft 17 from its aperture housing in upright wall member 3, thereby triggering micro switch 20 to cut off the electrical supply to the motor 11.

It can be seen that the use of generally planar members for the frame results in a machine which can be easily and inexpensively constructed and which is easy to maintain since the moulding means, conveying means, papering means and drive mechanism therefor are mounted on these members and are readily accessible for maintenance purposes. Moreover, the construction of the machine is such that there are few recesses or crevices where dirt etc might collect and present a health hazard and the generally planar members of the frame can be readily wiped clean particularly when the drum 13, scraper device and conveying means are removed which is a very simple operation. Further, those parts of the machine likely to come into contact with the raw material are formed of acetal resin which is an acceptable material in the food manufacturing industry.

Referring now to Figures 10 to 13, the machine includes a frame comprising a generally planar base member 101, a generally planar wall member 102 perpendicularly secured to the upper face of the base member 101, and a generally planar upper member 103 secured to the wall member 102 so as to be generally parallel to the bottom member 101. The members 101 and 103 are formed of an acetal resin such as that known as Delrin (Du Pont) and wall member 102 is formed of stainless steel. Two additional supports 104 and 105 are provided between the base member 103 and the upper member 101 at the rear to provide extra rigidity.

An electrically driven motor 106 including a gear

box 107 is mounted on the upper surface of the base member 101. If desired, the motor may be mounted horizontally as shown by the dotted line 106a. A moulding means in the form of a drum 108 is keyed on to a shaft 109 extending through an aperture in the wall member 102 and mounted for rotation therein. By use of a key in this way, the drum 108 can be readily withdrawn from the shaft to enable the drum, shaft and wall member to be cleaned. The drum is also formed of an acetal resin and includes, in its circumferential surface, a mould having a circular mould cavity 110. (It will be appreciated that the mould cavity can be of any desired shape and that the drum may include more than one mould cavity). The bottom of this mould cavity 110 is defined by a plunger 111 arranged to reciprocate within the mould cavity 110 between a retracted position in which the cavity can receive raw material and a forward position in which the free surface of the plunger 111 protrudes slightly beyond the circumferential surface of the drum 108. The reciprocal movement of the plunger 111 is controlled by a plunger cam 112 rigidly secured to the wall member 102 and having a profile which is followed by cam follower 113 on the plunger 111. The shaft 109 terminates in a bevel gear 114 in mesh with a bevel gear 115 on a drive shaft 116 driven from gear box output shaft 117 via bevel gears 118.

The machine also includes a conveying means for removing, from the machine, the patties formed by the moulding means. This conveying means comprises a first roller 119 fixed to a shaft 120 passing through an aperture in the wall member 102 and mounted for rotation therein. The shaft 120 carries a pulley 121 which is driven by a belt 122 from a pulley 123 on the output shaft 117 of the gear box 107. A second roller 124 is mounted at an end of a platform 125 detachably secured to the wall member 102 by a rod 151 extending

into an aperture in the wall member 102. The arrangement is such that the platform 125 would pivot about rod 151 in an anticlockwise direction as viewed in Fig 8 in the absence of a stop 156 provided on the wall member 102. A conveyor belt 126 extends around rollers 119 and 124 so as to be driven by the roller 119. The rollers 119 and 124 are both formed of acetal resin and the conveyor belt 126 is formed of a material which can readily be kept clean and is approved for food contact. By pivoting the platform 125 in the clockwise direction, the effective distance between rollers 119 and 124 can be shortened to facilitate removal and refitting of the conveyor belt 126. The roller 119 and the platform carrying roller 124 can be readily detached from the wall member 102 for cleaning purposes.

A pair of arms 152 and 153 is provided on the platform 125, one at each end of roller 124, and a scraper wire is stretched between the arms so as to bear against the conveyor belt 126 to strip the patties therefrom.

A hopper 127 in the form of an open ended tube of stainless steel is seated on the upper surface of the upper member 103. The upper member 103 includes an aperture 128 whereby raw material can pass from the hopper 127 into the mould cavity 110 of the drum 108. (If desired, the hopper may include a bottom wall provided with an aperture in registry with the aperture 128). A paddle in the form of a pair of stainless steel blades 129 is provided in the hopper 127 and these are affixed to the upper end of shaft 116 so as to rotate with the shaft 116. The blades are angularly displaced relative to each other by about 15°. The blades are angled and, as they rotate, they co-operate with a pair of bars 152 attached to the hopper 127. In this way, rotation of the blades 129 forces the raw material in the hopper through the aperture 128. The

upper end of the hopper is protected by a grid 130 which is inter-linked with the electricity supply to the motor 106 whereby the motor will stop in the event that an attempt is made to remove grid 130 whilst the machine is operating.

The machine includes a spring loaded scraper device for detaching the shaped portion from the drum surface. This device includes a supporting rod 131 including a spring-loaded ball 132 whereby the device may be detachably mounted in a housing 154 in an aperture in the wall member 102. The rod includes a pair of arms 133 and 134 between the free ends of which a scraper wire 135 extends. The mounting of the device is such that scraper wire 135 is biased into contact with the circumferential surface of the drum 108 and detaches each patty from the drum as the drum rotates. A tensioning device 136 is provided whereby the tension in the scraper wire 135 can be adjusted. A carriage 137 is mounted on rod 131 so as to be slidable there along and this carriage includes a wiping means 138 arranged to contact the scraper wire 135. By reciprocating the carriage 137 along the rod 131, the scraper wire 135 is wiped clean of raw material by the wiping means 138.

The machine includes a papering means for applying a sheet of paper to each patty. This papering means includes a frame 140 pivotally mounted on the upper member 103 preferably in a manner such that it can be readily detached for cleaning purposes. The frame 140 has an open side which is adjacent to the drum 108 and includes a stack of paper sheets which is biased towards the open side by means of a spring (not shown). Each sheet includes an aperture whereby it is suspended on a knife edge (not shown) secured to frame 140. The papering means includes an arm 141 pivotally mounted at one end to the frame and terminating at its other end in a cam follower 142. The angle of inclination of the

arm 141 can be varied and the arm can be locked in a desired inclination by means of nut 143. The cam follower 142 follows the profile of a cam 144 mounted for rotation with the drum 108 under the influence of spring 155.

The machine includes sidewalls 145 which are held in grooves 146 and 147 provided in the under surface of the upper member 103 and the upper surface of the base member 101 and in grooves 154 in the rear face of wall member 102. These sidewalls 145 are locked in the grooves by a rear wall 148 which is operably connected to the electricity supply for the motor 106 so that any attempt to remove the rear wall whilst the machine is operating will result in stoppage of the motor 106.

In the case where a horizontally mounted motor 106a is used, a bulge denoted by dotted line 48a is provided in the rear wall to accommodate the motor.

In use, minced meat or other raw material is inserted in the hopper 127 and is agitated by the blades 129 and urged through the aperture 128. As the drum 108 rotates, the arrangement of the plunger cam 112 is such that the plunger 111 is fully retracted from the circumferential surface of the drum 108 when the mould cavity 110 is in registry with the aperture 128. Thus, raw material is forced into the mould cavity 110 and is formed into a disc-shaped patty in conformity with the shape of the cavity. Continued rotation of the drum causes the plunger 111 to slide within cavity 110 as a consequence of the cam follower 113 following the profile of the plunger cam 112 whereby the patty is pushed out of the mould cavity 110 but remains adhered to the free surface of the plunger 111 (which surface is now projecting beyond the circumferential surface of the drum) due to its natural tackiness and hydraulic forces. As the patty starts to be ejected from the mould cavity, it passes the papering means which is urged towards the patty under

the influence of spring 155 as the cam follower 142 follows the profile of the cam 144. As a result, the outermost sheet of paper in the frame 140 contacts the free surface of the patty and adheres thereto. Continued rotation of the drum causes the knife edge to cut the sheet of paper and allow it to be pulled from the frame 140. The rotation of the drum also causes the frame 140 to revert back to a position where it is spaced from the drum surface against the spring under the influence of the cam 144. Meanwhile, the rotating drum carries the shaped patty together with its paper sheet towards the conveyor belt 126. The papered patty is removed from the drum 108 by the scraper wire 135 and drops onto the conveyor belt 126. It is thereby carried out of the machine and removed from the belt by the scraper wire of platform 125. Further rotation of the drum brings the mould into registry with aperture 128 to receive further raw material for forming into another patty. Any raw material adhering to the scraper wire 135 can be readily removed by sliding the carriage 137 along rod 131 to cause wiping means 138 to traverse the wire 135. If necessary, the scraper device can be readily detached from the wall member 102 for cleaning purposes by withdrawing the rod 131 from its aperture in the housing 154.

An interlocking safety system, as shown in the embodiment of Figures 1 to 9, may be included.

It can be seen that the use of generally planar members for the frame results in a machine which can be easily and inexpensively constructed and which is easy to maintain since the moulding means, conveying means, scraper device, papering means and drive mechanism therefor are mounted on these members and are readily accessible for maintenance purposes once the side walls 145 and rear wall 148 have been removed which is itself a simple operation. Moreover, the construction of the machine is such that there are few recesses or crevices

where dirt etc might collect and present a health hazard and the generally planar members of the frame can be readily wiped clean particularly when the drum 108, scraping device and conveying means are removed which is a very simple operation. Further, those parts of the machine likely to come into contact with the raw material are formed of acetal resin which is an acceptable material in the food manufacturing industry.

In an embodiment the position of the papering means with respect to drum 13, 108 may be readily adjusted by rotation of cam 67, 144 about shaft 14, 109. Drum 13, 108 is rigidly fastened to shaft 14, 109 and hence the orientation of cam 67, 144 with respect to drum 13, 108 (and therefore mould cavity 22, 110) is governed by the rotation of cam 67, 144 about shaft 14, 109. Cam follower 65, 142, is rigidly fastened to the papering means and, as before, is maintained in contact with cam 67, 144 at all times through a biasing means 68, 155. Cam 67, 144, once positioned, is fastened to shaft 14, 109, for example by means of a collar 300 located adjacent to cam 67, 144 and rigidly fixed to shaft 14, 109 to which cam 67, 144 may be coupled, for example by means of pin 301. Collar 300 is provided with a plurality of holes 302 arranged such that each may accommodate pin 301, located in cam 67, 144, thereby forming a mechanical link between collar 300 and cam 67, 144. Alignment of pin 301 with the appropriate hole in collar 300 and incorporation of pin 301 therein allows selection of the relative orientation of cam 67, 144 and mould cavity 22, 110. Cam 67, 144 is then able to undergo rotation due to the rotation of shaft 14, 109 during operation of the machine. Drum 13, 108 and cam 67, 144 rotate together since drum 13, 108 is mounted on shaft 14, 109, and cam follower 65, 142 is thus guided along the surface of cam 67, 144. In this manner, the displacement between the papering means and the surface of drum 13, 108 may

be varied.

By employing an appropriately shaped cam it is possible to obtain the desired spacing between the papering means and drum 13, 108 during rotation and to ensure optimum positioning of the papering means with respect to mould cavity 22, 110 at the point in the cycle at which mould cavity 22, 110 and the papering means coincide. In this way contact between paper dispensed by the papering means and the outer surface of a shaped portion adhered to the surface of the drum 13, 108 may be ensured.

The method of adjustment disclosed hereinabove allows simple and accurate adjustment of the position of the papering means with respect to the surface of drum 13, 108 without the need for an intricate mechanism (such as lockable pivotable arm 141) to be included as part of the papering means.

Although the foregoing description is primarily concerned with the shaping of minced meat to form hamburgers, it will be appreciated that the invention is applicable to the production of shaped portions of any material which can be formed into a coherent shape such as butter, cake mixture, fish and sausage meat.

Indeed, it will be further appreciated that the invention may also be used in conjunction with non-food products which satisfy the requirement of being easily shaped and possessing sufficient tackiness to allow adhesion to the drum surface. Thus, any material possessing appropriate rheological behaviour may be shaped in the mould cavity of the present invention, optionally covered with a sheet material from a suitable dispensing means and conveyed away from the shaping means.

Claims:

1. A machine for forming raw material for food products into shaped portions which machine comprises a frame formed from a generally planar base member, a generally planar upper member and a generally planar wall member linking the base and upper members together in a generally parallel relationship, a moulding means for forming the raw material into a portion of the desired shape, a scraper device for removing the shaped portion from the moulding means, a conveying means for transporting the shaped portion out of the machine, and drive means for the moulding means and conveying means, wherein said drive means, moulding means, scraper device and conveying means are all mounted on one or other of said members.

2. A machine as claimed in claim 1 wherein the base and upper members are linked together by means of a second generally planar wall member spaced from the first-mentioned generally planar wall member.

3. A machine as claimed in claim 2 wherein said drive means comprises a motor and means of transmitting motion from the motor to the moulding means and conveying means, said transmitting means being located between the wall members.

4. A machine as claimed in claim 3 wherein the motor is mounted on one of the wall members.

5. A machine as claimed in claim 4 wherein the moulding means, scraper device and the conveying means are located on that side of the wall member which is remote from the drive motor.

6. A machine as claimed in any preceding claim wherein the members forming the frame are formed from two or more separate components appropriately secured together.

7. A machine as claimed in any preceding claim wherein the moulding means comprises a rotable drum which includes at least one mould cavity in its

circumferential surface.

8. A machine as claimed in any preceding claim wherein the machine also includes a papering means for applying sheet material to a face of the shaped portion.

9. A machine as claimed in claim 8 wherein the papering means is mounted on one or other of the members.

10. A machine as claimed in claim 8 or 9, when appended to claim 7, which includes a cam mounted on a shaft for rotation with the rotatable drum wherein the orientation of said cam determines the position of the papering means with respect to the drum, said cam being fixed to the shaft by a coupling means which allows adjustment of the orientation of the cam with respect to the shaft.

11. A machine as claimed in claim 8, 9 or 10 wherein the papering means is mounted on the upper member.

12. A machine as claimed in any preceding claim wherein the scraper device reciprocates between a first limit position where it contacts the surface of the moulding means and a second limit position in which it is remote from the moulding means, and the drive means reciprocates the scraper device between said first and second portions.

13. A machine as claimed in any preceding claim which machine further includes a hopper mounted on top of the upper member and a paddle situated therein to force the raw material through an aperture in the upper member and into the moulding means.

14. A machine as claimed in claim 13 wherein the moulding means, the conveying means, the paddle and the scraper device are all driven by the same motor.

15. A machine as claimed in any preceding claim wherein the frame members, moulding means, and other components which contact the raw material, are formed of a material selected from; acetal resin, stainless

steel, suitably covered aluminium, or similar materials acceptable in the food industry.

16. A machine for forming raw material for food products into shaped portions which machine comprises a moulding means for forming the raw material into a portion of the desired shape, a scraper device for removing the shaped portion from the moulding means, a conveying means for transporting the shaped portion out of the machine, and drive means for the moulding means, scraper device and conveying means, the arrangement being such that the scraper device reciprocates between a first limit position where it contacts the surface of the moulding means to remove the shaped portion therefrom and a second limit position in which it is remote from the moulding means, said drive means reciprocating the scraper device between said first and second positions.

17. A machine as claimed in any preceding claim wherein the scraper device includes a supporting shaft, first and second arms rigidly mounted thereon and a scraper wire extending between the ends of the arms.

18. A machine as claimed in claim 17 wherein the scraper device includes a wiping means to wipe the scraper wire clean of raw material.

19. A machine as claimed in claim 18 wherein the scraper wire is automatically wiped clean by the wiping means when said scraper wire is remote from the moulding means.

20. A machine as claimed in claim 18 or 19, when appended to claim 7, wherein the wiping means comprises a rotating cam driven in cooperation with the moulding means such that one revolultion of the moulding means corresponds to one revolution of the cam, a cam follower which undergoes reciprocating motion as determined by the profile of said cam, wherein the cam follower is connected to the scraper device such that reciprocating motion of the cam follower results in

reciprocating motion of said scraper device, and a detecting means to ascertain the orientation of the cam and scraper device, said detecting means actuating a two-way pneumatic piston which slides an element along the scraper wire to clean the same.

21. A machine as claimed in claim 17, 18, 19 or 20 wherein the scraper device includes a tensioning device, said tensioning device including a member rotatably mounted on the shaft whereby the scraper wire can be tensioned by rotation of the member.

22. A machine for forming raw material for food products into shaped portions and including a scraper device for removing the shaped portion comprising a tensioned scraper wire, wherein the wire is tensioned by rotation of a tensioning device which is adapted to undergo free rotation only in a sense such as to increase the tension in the wire.

23. A machine as claimed in claim 22 wherein the scraper device includes a supporting shaft, first and second arms rigidly mounted thereon and with the scraper wire extending between the ends of the arms and wherein the tensioning device comprises a hand knob rotatably mounted on the shaft, said knob being formed of two parts, an outer body and an inner body, which are mechanically coupled by a one way device such that they may undergo relative rotation in one direction only.

24. A machine as claimed in claim 23 wherein the one way device is a free-wheeling clutch ratchet mechanism.

25. A machine substantially as hereinbefore described with reference to and as illustrated in Figures 1 to 4, 8 and 9 or Figures 5, 6, 7, 14 and 15 or Figures 10 to 13 of the accompanying drawings.

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Databases (see over)

(i) UK Patent Office

(ii)

Search Examiner

MR P LEIGHTON

Date of Search

18 NOVEMBER 1992

Documents considered relevant following a search in respect of claims

Category (see over)	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2192866 A	(CROSS) see drum 13, scraping wire 61 in Figures 2 and 7	1 at least
X	GB 1524186	(BLUE BIRD) see cavities 11 and ejector mechanism 16 Figure 2	1 at least
X	GB 1402344	(WORDEN) see cavity 14 and plate 16 Figure 1	1 at least
X	GB 1351805	(LEHARA) see drum 22 and associated apparatus Figure 1	1 at least
X	GB 1199049	(FMC CORPN) Whole disclosure	1 at least
X	GB 960336	(SAPAL) see scraper 9 and conveyor 14 in Figures 1 & 2	1 at least
X	GB 542428	(MORTON) see Ejector mechanism Figure 1	1 at least
X	GB 461429	(MARSDEN) whole disclosure	1 at least
X	EP 0251367	(DE BOER) see mould cavities 4, press out mechanism 10 and conveyor 14 Figure 5	1 at least

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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Documents considered relevant following a search in respect of claims

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	US 3137029 (DE ZOLT) see wheel 22, scraper 40 and conveyor 60 Figure 1	1 at least

Category	Identity of document and relevant passages	Rele t to claim(s)

Categories of documents

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